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Gravitational waves from an axion cloud around a rotating black hole

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The string theory suggests the possible existence of scalar fields with tiny masses called string axions. Such a scalar field grows around a rotating astrophysical black holes by extracting rotation energy of that black hole due to the mechanism called the superradiant instability and forms an axion cloud. The self-interaction of the scalar field becomes important at the final stage of that instability, and predicting the phenomena at this stage is a difficult problem. In this talk, I introduce our new formalism to calculate the long-term evolution of the axion cloud, and discuss the emission of gravitational waves from that system.

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